REMARKS/ARGUMENTS

Reconsideration and withdrawal of the rejections set forth in the above-identified Office Action are respectfully requested.

The thoroughness of Examiner Butler's review of this application is appreciated. By this Amendment, a minor grammatical error in claim 5 has been corrected.

There are presently pending claims 1-3, 5-14, 16-22 and 25-34. Applicants respectfully submit that all of the claims are patentable and should be allowed.

Claims 1-3 and 5-9, 25-30 and 34 were provisionally rejected on the ground of obviousness-type double patenting over claims 1-3 and 5-7 of copending application Serial Number 11/205,952. This rejection was provisionally made as the referenced application has not issued as a patent.

Applicants respectfully submit that the present claims are clearly patentable over the cited claims of the copending application and therefore request that such rejection be withdrawn. It is noted that the referenced application was filed subsequent to the filing of the subject application. Applicants respectfully submit that no double patenting currently exists as no application has issued, and a clear line of demarcation between the claims of both applications will be maintained. If necessary, Applicants may submit a terminal disclaimer to obviate any remaining double patenting rejection.

The withdrawal of the anticipation rejection based on Kavesh et al. (USP 4,551,296) is noted with appreciation. All of the claims are now rejected under 35 USC

§103 (a) based on Kavesh et al. ("Kavesh") in view of several other patents, namely Maurer et al. ("Maurer") , van Breen et al. (van Breen) , and Suwanda et al. ("Suwanda") This rejection is most respectfully traversed.

To briefly summarize, this invention is directed to a process for drawing gel-spun multi-filament polyethylene yarn which has reduced denier and increased yarn properties, and these properties are achieved with enhanced efficiency, productivity and lower cost. The process includes drawing a feed yarn, preferably in an essentially undrawn state, and which feed yarn has certain properties (e.g., intrinsic viscosity of the polyethylene and tenacity of the yarn as claimed). The yarns are drawn in a forced convection air oven under certain narrowly defined conditions, and the air in the oven is in a turbulent state. The conditions of drawing are set forth in the equations that appear in the claims and in the specification. These equations interrelate the length of the oven, the entrance speed and exit speed, the yarn draw rate and the nominal residence time in the oven. In addition, preferably the productivity of the process is more than certain amounts as recited in the claims. It is respectfully submitted that these features as claimed are not taught or suggested by Kavesh or any of the secondary references.

The rejection is postulated on the basis that Kavesh shows a similar process as claimed but does not teach a tube length of 1.5 meters for Example 533 of the reference. It was considered obvious to use this tube length for the tube in Example 533 of Kavesh since was stated to be a suitable tube length in the rejection. In addition, Maurer is relied on as teaching a similar oven length of 1 meter. It was considered obvious to combine the oven length of Maurer in the process of Kavesh because the latter requires a length for the stretching apparatus and Maurer teaches a stretching oven length for stretching polyethylene.

It was also noted that Kavesh teaches using nitrogen but does not expressly teach using air. Van Breen was relied upon as using an environment that is either nitrogen or air. It was concluded that it would have been obvious to combine the use of air in van Breen with the process of Kavesh since both are suitable environments for stretching.

It was further recognized that Kavesh does not suggest using a process which includes forcing the air. Suwanda was relied upon as teaching drawing yarn in a forced air convection oven wherein the air circulation is in a turbulent state. It was concluded that it was obvious to combine the practice of using forced air convection in Suwanda with the process of Kavesh in order to control the air temperature.

The rejection also is based on the conclusion that extracting the solvents from the filament in Kavesh would result in fewer than 2 methyl groups per thousand carbon atoms (or less in certain claims). The number of methyl groups is indicative of side chains in the polyethylene polymer from which the yarns are made. It is submitted that the phrase in claim 1 that the polyethylene has "fewer than two methyl groups per thousand carbon atoms" refers to the polyethylene polymer from which the yarns are formed. The polyethylene polymer contains hardly any methyl groups and contains less than 2 weight percent of other constituents, as claimed in claim 1. There is no disclosure in the Kavesh patent concerning the number of methyl groups per thousand carbon atoms in the polyethylene polymer that is used to make the filaments.

Most of the points mentioned in the Office Action were discussed in the previous Amendment, to which the Examiners' attention is respectfully directed. The main issues between what is stated in the above-identified Office Action and Applicants' position can be summarized as follows. (1) What are the differences between drawing a multi-filament yarn in a tube under a nitrogen blanket versus drawing in a forced air oven under

turbulent conditions? (2) Can one assume that the throughput capacity will vary linearly with the number of filaments in a yarn drawing process? (3) Is there a difference between throughput capacity for a spinning process compared with a drawing process? (4) In Example 523 of Kavesh, could the first stage draw ratio have been increased? (5) Would one skilled in the art expect the mass throughputs that are achieved in this patent application?

With respect to some of the arguments on these points, in the above-identified Office Action it was stated that arguments of counsel cannot take the place of evidence in the record (see page 18 of the Office Action). In response to such statement, attached hereto is a Rule 132 Declaration for the consideration of the Examiner.

The attached Declaration is from Dr. Sheldon Kavesh, the first named inventor in the Kavesh patent that is the principal reference applied against the claims of this application. Dr. Kavesh is an expert in the art of high strength polyethylene fibers and is a named inventor of 57 United States patents. His work has been highly recognized in the field, as summarized in Dr. Kavesh's Declaration. For completeness, Dr. Kavesh is a consultant for the assignee of this application.

Dr. Kavesh has reviewed the present application, the outstanding Office Action and the references cited against the claims of the application. As set forth in his Declaration, Dr. Kavesh answers the above questions as follows:

(1) There are substantial differences between drawing polyethylene fibers in air under turbulent conditions versus drawing in a tube under a nitrogen blanket. In view of these differences, Dr. Kavesh expresses his opinion that the drawing of a polyethylene

yarn in a forced convection oven under turbulent flow of air is not obvious from the teachings of any of the applied references.

(2) It is incorrect to assume that the mass throughputs would vary linearly as postulated in the rejection and the throughputs for 16, 120 and 240 filaments cannot correctly be assumed to be the values as stated in the Office Action. Dr. Kavesh states that the tenacity of a yarn generally decreases with increased number of filaments. If the desired result is a constant yarn tenacity, an increase in the number of filaments may not increase the mass throughput of yarn in a drawing process. The relationship of yarn mass throughput to the number of filaments depends on many specific factors, including the stress-strain characteristics, the filament to filament uniformity and the drawing conditions.

(3) The fact that the Kavesh patent states that the number of spinning apertures is not critical does not imply that the mass throughput at some necessary level of filament quality will be proportional to the number of filaments, even at the spinning stage.

(4) The first stage draw ratio of Example 523 of the Kavesh patent could not be increased as the draw ratio was the maximum that could be achieved without filament breakage.

(5) Dr. Kavesh was very surprised by the high mass throughputs that were achieved herein. Such throughputs evidently reflect a higher heat transfer rate to the yarns and more uniform temperatures as a result of drawing under the conditions claimed herein than what he obtained by tube drawing in the Kavesh patent. The high mass throughputs provide higher productivity and lower costs.

Thus, Dr. Kavesh has rebutted the bases for the rejection of the claims of this application and he is of the opinion that the results of this application are unexpected. It is respectfully submitted that the Declaration of Dr. Kavesh together with the arguments made herein and in the previous Amendment clearly demonstrate the patentable nature of the invention claimed herein.

The rejection relies on several secondary references in an attempt to rectify the deficiencies in the Kavesh patent disclosure. Maurer has been cited as showing an oven length of 1 meter. However, the oven of Maurer is in contrast to the tube of Kavesh, as pointed out in the attached Declaration. Importantly, Maurer is directed to a polyethylene fiber which includes a large amount of a filler. The fillers of Maurer are present in an amount of at least about 5% (see column 3, lines 29-32). In contrast, the claims of this invention call for a polyethylene that has less than 2 wt % of other constituents. Hence, to follow the practice of Maurer would be to require the presence of a large amount of filler which would result in a substantially different product than claimed herein.

Moreover, it is respectfully submitted that one skilled in the art, looking to improve upon the process of Kavesh, would not import the disclosure of Maurer since Maurer is directed to a filled fiber and Kavesh is not, and Maurer is directed to oven stretching while Kavesh utilizes a tube. Therefore, it is respectfully submitted that one skilled in the art would not combine the references as suggested. Even if the combination of these references were somehow considered to be proper, the claimed invention would still not be shown due to the failure of Maurer to suggest the features missing in Kavesh mentioned above. For example, Maurer also fails to suggest stretching in a forced air circulation oven with the air being in a turbulent state.

Van Breen was cited as teaching a stretching environment that is either nitrogen or air. However, this reference is directed to fibers of an alternating copolymer of ethylene and carbon monoxide as opposed to high strength polyethylene fibers. Thus, there is no reason that one skilled in the art would combine these references in view of the different type of fibers disclosed in each patent. Moreover, even though van Breen briefly mentions air in passing, it really teaches away from the use of air. In particular, the reference states at column 4, lines 9-12 that:

> "Preferably the environment is inert with respect to the polymer fiber. Nitrogen is a preferred inert gaseous environment for conducting the stretching operation."

Indeed, all of the examples use nitrogen rather than air. It is further submitted that even if the teachings of van Breen were combined with that of Kavesh, the claimed invention would still not be shown due to the features missing in Kavesh. These features include the use of a turbulent air flow.

Suwanda was cited as teaching drawing a yarn in an oven wherein the air circulation is in a turbulent state. This reference is directed to cross-linked polyethylene rather than the polyethylene of Kavesh. Moreover, it is not at all clear that Suwanda teaches drawing in a forced convection oven. In the disclosure at col. 7, lines 14-16, Suwanda states that the second stage draw occurs between the second godet 24 and the belt puller 28. As illustrated in Fig. 2 of Suwanda, the forced air convection oven 26 is located downstream of the draw zone. Thus, the description at col. 7 and the illustration of Fig. 2 are inconsistent with one another. As a result, it is submitted that neither can be relied upon.

In addition, it is not seen where Suwanda teaches that the air in the oven is in a turbulent state, as stated at page 6 of the Office Action. Forced convection heat transfer can be in a laminar flow regime. See, for example, page 10-15 of the Perry's Chemical Engineers Handbook attached to the Declaration of Dr. Kavesh. The turbulent state of the air in the inventive process confers significant advantages not taught or suggested by Suwanda.

Accordingly, it is respectfully submitted that one skilled in the art would not combine the teachings of Kavesh and those of Suwanda. Even if these references were properly combined it is submitted that the claimed invention would still not be shown.

In view of the above, it is respectfully submitted that any proper combination of the applied references would not result in the invention as claimed herein. Accordingly, it is respectfully submitted that all of the independent claims, as well as the dependent claims, are patentable.

With respect to the comments in the rejection concerning claim 2, it is respectfully submitted that it is merely conjecture to assume that the mass flow in the Kavesh patent would increase linearly with the number of filaments. Indeed, this has been contradicted by the Declaration of Dr. Kavesh. Accordingly, claim 2 is submitted to be further patentable over the proposed combination of references. The same applies to claims 13 and 25-33.

With regard to claim 5, it is submitted that Kavesh does not disclose a polyethylene feed yarn having fewer than one methyl group per thousand carbon atoms. The same applies to the features of claims 11, 12, 16, 22, 29 and 34.

With regard to the feature of claim 9 concerning the tenacity of the feed yarn being from 26 to 46 g/d, the rejection relies upon the use of increased stretching in Example 523 of Kavesh in order to obtain higher feed yarn in Example 533 of that patent. However, this has been refuted in Dr. Kavesh's Declaration wherein he states that the first stage draw ratio of Example 523 was at the maximum and could not be increased.

Concerning claim 34, in the rejection it was stated that equation set 1 is broader than claim 1 and that the "consisting essentially of" in the preamble is being construed as "comprising". It is respectfully submitted that this conclusion is improper.

Applicants' specification teaches drawing processes that permit the accomplishment of objectives of reducing denier and increasing yarn properties with enhanced efficiency, productivity and lower cost. See, for example, page 3, lines 2-3 of the Specification. The basic and novel characteristics of the invention are clearly indicated in the conditions for drawing of Equations 1a-1d or alternatively in Equations 2a-2d. There is no teaching in the Kavesh patent to the drawing conditions of these equations or any example that does not fall outside of one or the other set of drawing conditions.

As the basic and novel characteristics of the invention are clearly stated in Applicants' specification and claims, the term "consisting essentially of" in claim 34 must be regarded under MPEP §2111.03 as of more limited scope in that respect than claim 1. Thus, the term "consisting essentially of" should be considered to limit the scope of a claim to the specified materials or steps and those that do not materially affect the basic and novel characteristics of the claimed invention. Since claim 1 has been

demonstrated to be novel and non-obvious, it is submitted that so is claim 34. Accordingly, claim 34 is also submitted to be patentable.

In view of the above, Applicants respectfully submit that all of the claims are patentable and should be allowed. Therefore, reconsideration and withdrawal of the rejections of claims 1-3, 5-14, 16-22 and 25-34 are most respectfully requested.

Applicants also respectfully request that withdrawn claims 4, 15, 23 and 24 be rejoined with the other claims since generic linking claims should be patentable, as pointed out above.

Accordingly, Applicants respectfully request reconsideration of the previous rejections and allowance of this application. Early notification to that effect is most respectfully solicited.

Should the Examiner believe that a discussion with the undersigned would in any way be of assistance, he is respectfully requested to telephone the undersigned.

Respectfully submitted,
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Attachment

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